FEM 1.209: 310186

FLOOD INSURANCE STUDY

COMPLETED
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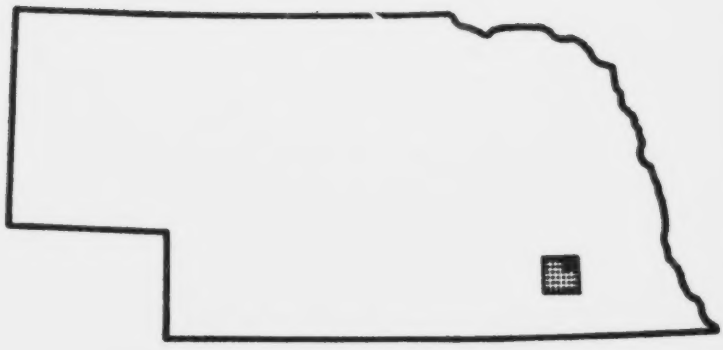
CITY OF CRETE, NEBRASKA
SALINE COUNTY



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PUBLISHED SEPARATELY:

Flood Insurance Rate Map

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FLOOD INSURANCE STUDY
CITY OF CRETE, SALINE COUNTY, NEBRASKA

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the City of Crete, Saline County, Nebraska, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study will be used to convert Crete to the regular program of flood insurance by the Federal Emergency Management Agency (FEMA). Local and regional planners will use this study in their efforts to promote sound flood plain management.

In some states or communities, flood plain management criteria or regulations may exist that are more restrictive or comprehensive than those on which these Federally-supported studies are based. These criteria take precedence over the minimum Federal criteria for purposes of regulating development in the flood plain, as set forth in the Code of Federal Regulations at 44 CFR, 60.1(d). In such cases, however, it shall be understood that the state (or other jurisdictional agency) shall be able to explain these requirements and criteria.

1.2 Authority and Acknowledgements

The source of authority for this Flood Insurance Study is the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were performed by Hoskins-Western-Sonderegger, Inc. for the Federal Emergency Management Agency, under Contract No. EMW-C-0064. This study was completed in September 1980. Background hydrologic and hydraulic data for the Big Blue River and Walnut Creek was provided by the U.S. Army Corps of Engineers, Kansas City District, for use in this study. Background hydrologic and hydraulic data for the Big Blue River was also provided by the Nebraska Natural Resources Commission (NNRC).

1.3 Coordination

Streams requiring detailed study were identified at a time and cost meeting held on June 7, 1979, attended by representatives of the City of Crete, FEMA, the NNRC and the study contractor. Results of the hydrologic analyses were coordinated with the U.S. Geological Survey (USGS), the Corps of Engineers, the Soil Conservation Service (SCS), the Lower Big Blue Natural Resources District and the NNRC.

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On September 3, 1980, preliminary results of the study were reviewed at an intermediate coordination meeting attended by representatives of the City of Crete, FEMA, the NNRC, and the study contractor.

On September 9, 1981, the final results of the study were reviewed at the final coordination meeting, which was also attended by representatives of the above organizations.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area and the one-mile extraterritorial jurisdictional zone outside the corporate limits of the City of Crete. The area of study is shown on the Vicinity Map (Figure 1).

The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development or proposed construction for the next five years, through September 1985. Flooding sources studied by detailed methods within the extraterritorial jurisdictional zone were the Big Blue River and Walnut Creek.

Approximate analyses were used to study those areas having a low development potential or minimal flood hazards. Two small tributaries of Walnut Creek and five small tributaries of the Big Blue River were studied by approximate methods within the extraterritorial jurisdictional zone.

The scope and methods of study were proposed to and agreed upon by FEMA and the City of Crete.

2.2 Community Description

The City of Crete is located in the northeastern corner of Saline County in southeastern Nebraska. It is situated approximately 19 miles southwest of Lincoln, Nebraska, 20 miles southeast of Seward, Nebraska, and 28 miles northwest of Beatrice, Nebraska. The community is surrounded by unincorporated areas of Saline County. The U.S. Census Bureau lists the 1970 population of Crete as 2,176.

The Big Blue River flows north to south along the west side of Crete. The drainage area of the Big Blue River at Crete is approximately 2,700 square miles.

Walnut Creek, a tributary of the Big Blue River, flows, generally, from northeast to southwest along the north side of Crete. The confluence of Walnut Creek and the Big Blue River is located

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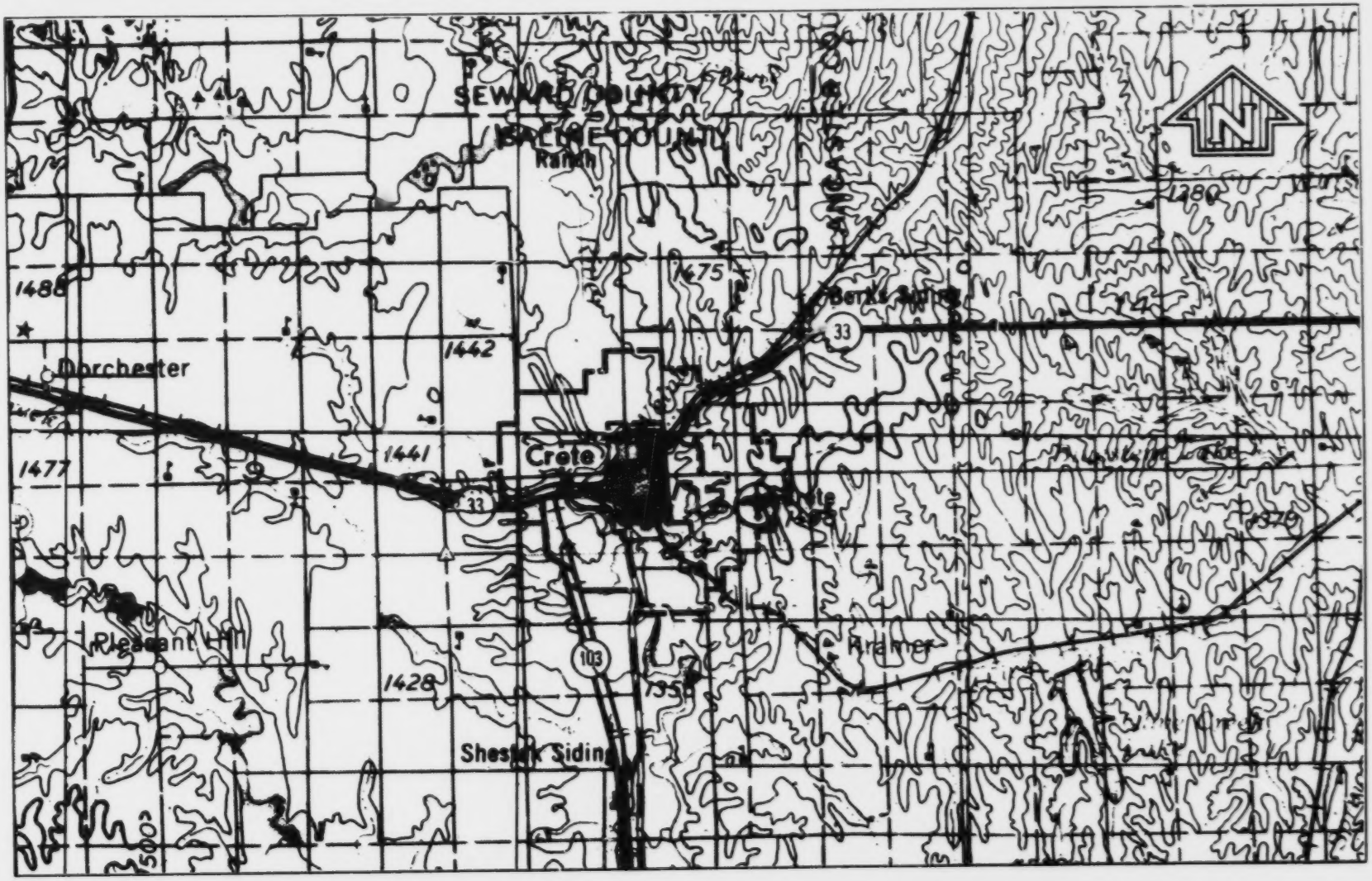

FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF CRETE, NB
(SALINE CO.)

APPROXIMATE SCALE
2 0 2 4 6 MILES

VICINITY MAP

in the northwest corner of Crete. The drainage area of Walnut Creek at its mouth is 12.2 square miles.

Much of the incorporated area of the City of Crete is located in the Big Blue River flood plain. This includes a large portion of the downtown business district and most of the residential areas in the community. Tuxedo Park, located in the northwest corner of Crete on the west side of the Big Blue River, is also in the flood plain. Development in the Walnut Creek flood plain is mainly agricultural.

The climate of the area around Crete is a typical central plains, continental climate. Average annual precipitation is approximately 30 inches, with most of the precipitation resulting from thunderstorms in May, June, July and August. Temperature extremes range from greater than 100°F. in the summer to lower than -20°F. in the winter. The mean frost-free period for the area is approximately 170 days (Reference 1).

2.3 Principal Flood Problems

Crete has a history of flooding from both the Big Blue River and Walnut Creek. Most past floods of the Big Blue River have been caused by widespread, heavy precipitation over the entire Big Blue River basin. Flooding may also result, however, from precipitation falling on frozen or snow-covered ground or from intense, localized storms which occur in the immediate area. Floods from Walnut Creek are most likely to occur from this last type of storm.

Major floods on the Big Blue River at Crete have occurred in 1903, 1923, 1930, 1949, 1950, 1951, 1957, 1960 and 1967 (Reference 2). Discharge records for the Big Blue River at Crete have been available since 1945, when the USGS installed a stream gage approximately 2 miles south of Crete. The three largest recorded floods are those of 1950, 1951 and 1967. The peak discharge measured for these floods at the USGS gaging station were 27,600 cubic feet per second (ft ^{3}/s), 25,500 ft ^{3}/s, and 24,300 ft ^{3}/s, respectively. The estimated recurrence intervals for floods of these magnitudes are 18 years, 15 years and 13 years, respectively. Even though the 1967 flood is only the third largest recorded peak discharge, the peak stage is the highest recorded. All three of these floods caused considerable damage to the residential areas in the northwest part of Crete. The 1950 flood also inundated low-lying portions of the downtown business district by passing through a culvert underneath the Burlington Northern Railroad at Hawthorne Avenue (Reference 2 and 3).

Major floods on Walnut Creek have occurred in 1923, 1930, 1950 and 1951 (Reference 2 and 3). No recorded discharges are available for these floods. All are known to have caused flooding

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in the residential areas in the northern part of Crete.

Flooding from the Big Blue River in Crete is aggravated by constrictive hydraulic structures, particularly the State Highway 33 and Burlington Northern Railroad bridges. These bridges and embankments have, at several times in the past, retarded the passage of floodwater and aggravated flooding in the northern parts of Crete. Flooding from Walnut Creek is also aggravated by constrictive hydraulic structures, such as the Main Avenue, 24th Street, 22nd Street, Hawthorne Avenue and Boswell Avenue bridges.

2.4 Flood Protection Measures

There are no flood protection structures or flood plain management measures which reduce potential flood damage from the Big Blue River in Crete.

The Lower Big Blue Natural Resources District is currently sponsoring the construction of five floodwater retarding dams in the Walnut Creek watershed. Three of these dams were completed in May 1980. One of the final two dams is currently under contract and is scheduled for completion in June 1982. There are no present plans to construct the final dam. These dams will control discharges from 5.4 square miles of the 12.2-square-mile Walnut Creek watershed. The dams result in as approximate 40% reduction in the 100-year flood peak discharge at the confluence of Walnut Creek and the Big Blue River. Flood hazard determinations for Walnut Creek were made assuming all five dams to be completed.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equalled or exceeded once on the average during any 10-, 50-, 100-, and 500-year period (recurrence interval), have been selected as having special significance for flood plain management and for flood insurance premium rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equalled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than one year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (one percent chance of annual occurrence) in any 50-year period is about 40 percent (four in 10), and for any 90-year period, the risk increases to about 60 percent (six in ten). The

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analyses reported here reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for floods of the selected recurrence intervals for each flooding source studied in detail affecting the community.

Peak discharge-frequency relationships for the Big Blue River have been developed using recorded peak discharges from the Big Blue River gaging station near Crete. This gaging station, located approximately 1.8 miles south of Crete, has a period of record of from 1945 to the present. The drainage area at the station is 2,716 square miles. The peak discharge-frequency relationship for the Big Blue River adopted for this Flood Insurance Study was developed by the U.S. Army Corps of Engineers and published in the 1977 Flood Plain Information Report for Crete (Reference 2). The USGS has also developed a peak discharge-frequency relationship for the Big Blue River at Crete, which was published in the October 1976 report, Magnitude and Frequency of Floods in Nebraska (Reference 4). The USGS relationship is nearly identical to the Corps of Engineers' relationship. The Corps of Engineers' peak discharge-frequency relationship was determined by a regional study of recorded peak discharges at a number of gages in the Big Blue River basin, utilizing log-Pearson Type III statistical analyses.

The peak discharge-frequency relationship for Walnut Creek was determined by developing a hydrologic model of the watershed using the SCS hydrology program (Reference 5). The hydrologic model was used in order to analyze the effect on peak discharges of the five dams being built in the Walnut Creek Watershed by the Lower Big Blue Natural Resources District. The analysis was conducted assuming all dams in place. The hydrologic model utilized the SCS dimensionless unit hydrograph, U.S. Weather Bureau rainfall frequency data (Reference 6), the SCS rainfall-runoff relationship, the SCS 24-hour type II rainfall distribution, the Convex method of channel routing and the Storage-Indication method of reservoir routing. The watershed was broken down into 14 sub-areas. Computed runoff hydrographs were routed through the dams and downstream channels. Peak discharges were assumed to occur at the time of average antecedent moisture conditions. The 500-year discharge was determined by extrapolating the discharge-frequency curve developed from the hydrologic model.

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Peak discharges for the 10-, 50-, 100-, and 500-year floods for each flooding source studied in detail in the community are shown in Table 1.

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA, (Square Miles)	PEAK DISCHARGES, (ft^3/s) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
BIG BLUE RIVER					
Crete Gage	2,716	21,500	42,500	53,000	83,000
WALNUT CREEK					
Confluence with Big Blue River	12.2[1]	2,450	3,840	4,580	6,900
0.42 Mile Above Mouth	11.1[1]	1,990	3,160	3,920	6,100
1.95 Miles Above Mouth	10.3[1]	1,610	2,500	3,080	4,700

[1]5.4 square miles controlled by upstream dams

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of the flooding sources studied in detail in the community were carried out to provide estimates of the elevations of floods of the selected recurrence intervals along each of these flood sources.

Valley cross sections used in the hydraulic analyses of the Big Blue River were field surveyed by the Nebraska Natural Resources Commission in 1975 and 1976 for use in their Big Blue River Flood Plain Study (Reference 7). Additional valley cross sections for the Big Blue River, all cross sections used in the hydraulic analyses of Walnut Creek, and all bridge elevation data and structural details were obtained from background data developed for the U.S. Army Corps of Engineers Flood Plain Information Report for Crete (Reference 2). The Corps' cross sections were taken from aerial topographic surveys made in 1976 (Reference 8). Bridge data was obtained from available bridge plans and from field surveys.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles. For stream segments for which a floodway was computed (Section 4.2), selected cross section locations are also shown on the Flood Boundary and Floodway Map.

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Roughness factors (Manning's "n") used in the hydraulic computations were chosen by engineering judgment, based on field observations of the streams and flood plain areas. For the Big Blue River, the roughness value used for the main channel was 0.040, and the flood plain roughness values ranged from 0.060 to 0.100. For Walnut Creek the main channel roughness value ranged from 0.035 to 0.045, and the flood plain roughness values ranged from 0.055 to 0.065.

Starting water surface elevations for the Big Blue River were taken from downstream flood profiles determined using field-surveyed cross sections provided by the Nebraska Natural Resources Commission (Reference 7). Starting water surface elevations for Walnut Creek were determined using the slope-area method. The flood profiles for Walnut Creek indicate backwater elevations from the Big Blue River where they exceed the elevations from Walnut Creek.

Water surface elevations of floods of the selected recurrence intervals were computed using the Corps of Engineers HEC-2 step-backwater computer program (Reference 9). Flood profiles were drawn showing computed water surface elevations for floods of the selected recurrence intervals. All elevations are referenced from the National Geodetic Vertical Datum of 1929 (NGVD), formerly referred to as Mean Sea Level Datum of 1929. Elevation reference marks used in this study are shown on the maps.

For the analyses of Big Blue River, the Burlington Northern Railroad was considered to act as a levee from upstream of 13th Street to about 18th Street. The 100-year and 500-year water surface elevations overtop the tracks in this area, but the large amount of obstruction caused by the railroad buildings and the small amount of overtopping in the unobstructed areas deemed it necessary to consider the tracks as a levee rather than as an effective area of weir flow.

For the tributaries to the Big Blue River and Walnut Creek studied by approximate methods, the 100-year flood elevations were determined by normal depth computations using Manning's equation. Cross sections were taken from the Corps of Engineers topographic maps (Reference 8) or from USGS topographic maps (Reference 10). Roughness factors (Manning's "n") were estimated based on field observations.

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown in the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

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4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages state and local governments to adopt sound flood plain management programs. Therefore, each Flood Insurance Study includes a flood boundary map designed to assist communities in developing sound flood plain management measures.

4.1 Flood Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by FEMA as the base flood for purposes of flood plain management measures. The 500-year flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the boundaries of the 100- and the 500-year floods have been delineated using the flood elevations determined at each cross section; between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:4,800 with a contour interval of 5 feet (Reference 8). In cases where the 100- and the 500-year flood boundaries are close together, only the 100-year boundary has been shown.

For the tributaries to the Big Blue River and Walnut Creek studied by approximate methods, the 100-year flood boundaries were delineated at each cross section; between cross sections the boundaries were interpolated using the above referenced topographic maps or using USGS topographic maps with a scale of 1:24,000 and a contour interval of 10 feet (Reference 10).

The boundaries of the 100- and 500-year floods are shown on the Flood Boundary and Floodway Map. Small areas within the flood boundaries may lie above the flood elevations, and, therefore, may not be subject to flooding. Owing to limitations of the map scale and/or lack of detailed topographic data, such areas are not shown.

4.2 Floodways

Encroachment on flood plains, such as artificial fill, reduces the flood-carrying capacity, increases flood heights and increases flood hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, the concept of a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, the area of the 100-year flood is divided into a floodway and a floodway fringe. The floodway is the channel of a stream plus any adjacent flood plain areas that must be kept free of encroachment in order that the 100-year flood may be carried without substantial increases in flood heights. Minimum standards of FEMA limit such increases in flood

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heights to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this report are recommended to local agencies as minimum standards that can be adopted or that can be used as a basis for additional studies. The results of the floodway computations have been tabulated at selected cross sections for each stream segment for which a floodway was computed (Table 2).

The floodway determined for the Big Blue River is the same floodway shown in the Nebraska Natural Resources Commission's Big Blue River Flood Plain Study (Reference 7). The location of this floodway was previously negotiated by the NNRC with the City of Crete.

The floodway determined for Walnut Creek was initially computed on the basis of equal conveyance reduction from each side of the flood plain. Final adjustments were made to prohibit encroachment in areas of high velocities and to insure a smooth and consistent floodway boundary. The Walnut Creek floodway was computed without consideration of backwater from the Big Blue River.

As shown on the Flood Boundary and Floodway Map, the floodway boundaries were determined at cross sections; between cross sections, the boundaries were interpolated. In cases where the boundaries of the floodway and the 100-year flood are either close together or collinear, only the floodway boundary has been shown.

The area between the floodway and the boundary of the 100-year flood is termed the floodway fringe. The floodway fringe thus encompasses the portion of the flood plain that could be completely obstructed without increasing the water surface elevation of the 100-year flood more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are shown in Figure 2.

5.0 INSURANCE APPLICATION

In order to establish actuarial insurance rates, FEMA has developed a process to transform the data from the engineering study into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors (FHF's), and flood insurance zone designations for each flooding source affecting the City of Crete.

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FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY	INCREASE (FEET)
Big Blue River								
A	426,900	3,160	23,050	2.3	1,347.2	1,347.2	1,347.9	0.7
B	429,700	1,680	19,558	2.7	1,348.0	1,348.0	1,348.7	0.7
C	431,100	1,545	13,693	3.9	1,348.4	1,348.4	1,349.1	0.7
D	434,500	2,000	15,914	3.3	1,352.0	1,352.0	1,352.3	0.3
E	435,235	360	8,303	6.4	1,354.6	1,354.6	1,354.7	0.1
F	435,610	370	6,021	8.8	1,357.0	1,357.0	1,357.0	0.0
G	435,860	1,380	23,375	2.3	1,357.0	1,357.0	1,357.9	0.9
H	439,280	2,750	35,291	1.5	1,357.4	1,357.4	1,358.3	0.9
I	440,240	2,800	33,079	1.6	1,357.5	1,357.5	1,358.4	0.9
J	441,380	2,840	21,587	2.5	1,357.5	1,357.5	1,358.4	0.9
K	443,880	2,910	30,297	1.7	1,358.2	1,358.2	1,359.1	0.9
L	444,480	3,010	21,548	2.5	1,358.3	1,358.3	1,359.2	0.9

[1] FEET ABOVE MOUTH

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF CRETE, NB

(SALINE CO.)

FLOODWAY DATA

BIG BLUE RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY	INCREASE (FEET)
Walnut Creek								
A	2,500	130	872	4.5	1,357.5	1,346.9[2]	1,347.7	0.8
B	2,700	170	1,139	3.4	1,357.5	1,348.3[2]	1,348.7	0.4
C	3,070	130	951	4.1	1,357.5	1,348.5[2]	1,348.9	0.4
D	3,170	130	1,183	3.3	1,357.5	1,350.6[2]	1,350.7	0.1
E	4,450	320	1,562	2.5	1,357.5	1,351.3[2]	1,351.4	0.1
F	4,550	90	736	5.3	1,357.5	1,352.2[2]	1,352.2	0.0
G	5,880	121	654	6.0	1,357.5	1,353.9[2]	1,354.7	0.8
H	5,980	175	981	4.0	1,357.5	1,355.3[2]	1,355.5	0.2
I	7,275	140	799	4.9	1,357.5	1,356.4[2]	1,357.1	0.7
J	7,375	290	2,763	1.4	1,362.8	1,362.8	1,362.8	0.0
K	8,000	100	998	3.9	1,362.8	1,362.8	1,362.8	0.0
L	8,750	200	1,090	3.6	1,363.2	1,363.2	1,363.5	0.3
M	9,000	320	871	4.5	1,363.7	1,363.7	1,364.0	0.3
N	9,500	89	578	6.8	1,366.1	1,366.1	1,366.2	0.1
O	10,500	168	773	4.0	1,368.8	1,368.8	1,369.6	0.8
P	13,000	85	490	6.3	1,374.1	1,374.1	1,374.9	0.8

[1]FEET ABOVE CONFLUENCE WITH BIG BLUE RIVER

[2]ELEVATIONS WITHOUT CONSIDERING BACKWATER FROM BIG BLUE RIVER

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF CRETE, NB
(SALINE CO.)

FLOODWAY DATA

WALNUT CREEK

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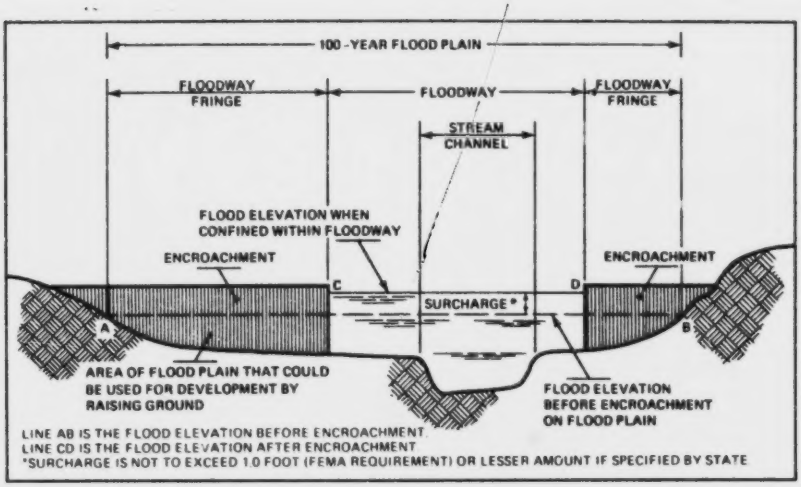
100-YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE*
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE AB IS THE FLOOD ELEVATION BEFORE ENCROACHMENT
LINE CD IS THE FLOOD ELEVATION AFTER ENCROACHMENT
*SURCHARGE IS NOT TO EXCEED 1.0 FOOT (FEMA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE

FIGURE 2 - FLOODWAY SCHEMATIC

5.1 Reach Determinations

Reaches are defined as lengths of watercourses having relatively the same flood hazard, based on the average weighted difference in water surface elevations between the 10- and 100-year floods. This difference does not have a variation greater than that indicated in the following table for more than 20 percent of the reach.

Average Difference Between 10- and 100-year Floods	Variation
Less than 2 feet	0.5 foot
2 to 7 feet	1.0 foot
7.1 to 12 feet	2.0 feet
More than 12 feet	3.0 feet

The locations of the reaches determined for the City of Crete are shown on the Flood Profiles and are summarized in Table 3, "Flood Insurance Zone Data."

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FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1% (100-YEAR FLOOD AND 10% (10-YEAR)	2% (50-YEAR)	0.2% (500-YEAR)	FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION[3] (FEET NGVD)
Big Blue River							
Reach 1	0001,0003 0004	-5.8	-1.4	2.3	060	A12	Varies - See Map
Reach 2	0001,0002	-8.4	-2.2	2.2	085	A17	Varies - See Map
Walnut Creek							
Reach 1	0002	-2.9	-0.4	0.7	030	A6	Varies - See Map
Reach 2	0002	-1.3	-0.5	1.1	015	A3	Varies - See Map

[1]FLOOD INSURANCE RATE MAP PANEL
[2]WEIGHTED AVERAGE
[3]ROUNDED TO THE NEAREST FOOT

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF CRETE, NB
(SALINE CO.)

FLOOD INSURANCE ZONE DATA

BIG BLUE RIVER AND WALNUT CREEK

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5.2 Flood Hazard Factors (FHF's)

The Flood Hazard Factor is used to correlate flood information with insurance rate tables. Correlations between property damage from floods and their assigned FHF's are used to set actuarial insurance premium rate tables based on FHF's from 005 to 200.

The FHF for a reach is the average weighted difference between the 10- and 100-year flood water surface elevations expressed to the nearest one-half foot and shown as a three-digit code. For example, if the difference between water surface elevations of the 10- and 100-year floods is 0.7 foot, the FHF is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5.0 feet, the FHF is 050. When the difference between the 10- and 100-year flood water surface elevations is greater than 10.0 feet, the accuracy for the FHF is to the nearest foot.

5.3 Flood Insurance Zones

After the determination of reaches and their respective FHF's, the entire incorporated area and the area of extraterritorial jurisdiction of Crete was divided into zones, each having a specific flood potential or hazard. Each zone was assigned one of the following flood insurance zone designations:

Zones A3, A6, A12, A17:	Special Flood Hazard Areas inundated by the 100-year flood, determined by detailed methods; base flood elevations are shown, and zones are subdivided according to Flood Hazard Factors.
Zone B:	Areas between the Special Flood Hazard Area and the limits of the 500-year flood; areas of the 500-year flood plain that are protected from the 100-year flood by dike, levee, or other water control structure; areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; and areas subject to 100-year flooding from sources with drainage areas less than 1 square mile. Zone B is not subdivided.
Zone C:	Areas of minimal flooding.

Table 3, "Flood Insurance Zone Data," summarizes the flood elevation differences, FHF's, flood insurance zones, and base flood elevations for each flooding source studied in detail in the community.

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5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the City of Crete is, for insurance purposes, the principal result of the Flood Insurance Study. This map (published separately) contains the official delineation of flood insurance zones and base flood elevation lines. Base flood elevation lines show the locations of the expected whole-foot water surface elevation of the base (100-year) flood. This map is developed in accordance with the latest flood insurance map preparation guidelines published by FEMA.

6.0 OTHER STUDIES

The Nebraska Natural Resources Commission's Big Blue River Flood Plain Study for Saline County (Reference 7) was published in July 1978. The purpose of this study was to develop the 100-year flood boundary and floodway boundary for the Big Blue River through Saline County.

The 100-year flood profile for the Big Blue River developed for this Flood Insurance Study is 0.5 feet to 1.0 foot lower than the NNRC 100-year flood profile, except in the vicinity of the State Highway 33, Burlington Northern Railroad, 13th Street, and Tuxedo Park Road bridges, where the Flood Insurance Study profile exceeds the NNRC profile by a maximum amount of 4.2 feet. The minor differences between the two profiles are due to differences in roughness values, difference in overbank reach lengths, and differences in interpretation of effective flow area at several cross sections. The largest differences between the two profiles, which occur at the above-mentioned bridges, were due to the fact that the NNRC did not include a detailed analysis of the bridges in their hydraulic model.

Differences in flood boundaries between the two studies are a result of the differences in the flood profiles. The NNRC floodway boundary, the location of which was negotiated by the NNRC with the City of Crete, was adopted for this Flood Insurance Study, despite the differences in flood profiles.

The Kansas City District of the Corps of Engineers published a Flood Plain Information Report for the Big Blue River and Walnut Creek at Crete in May 1977 (Reference 2). The purpose of this study was to develop profiles and boundaries for the 10-, 50-, 100-, and 500-year floods for the Big Blue River and Walnut Creek in the vicinity of Crete, Nebraska.

The 100-year flood profile for the Big Blue River developed for this Flood Insurance Study is from 0.4 feet below to 4.5 feet above the Corps' 100-year profile. The differences between the Flood Insurance Study profile and the Corps' profile are due to differences in cross section data and bridge modeling procedures.

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The Corps' profile was determined using cross sections taken from aerial topographic surveys (Reference 8). The Flood Insurance Study profile is based on field-surveyed cross sections provided by the NNRC.

The discharge-frequency relationship for Walnut Creek proposed for this Flood Insurance Study differs considerably from that used by the Corps in the Flood Plain Information Report (Reference 2). The reason for the difference is that the Corps' hydrologic model did not include the effects of the five dams being built in the Walnut Creek watershed by the Lower Big Blue Natural Resources District. The differences in flood profiles and flood boundaries between the two studies are due to these differences in the hydrologic analyses.

A Hydrologic Atlas providing historical information on flooding in the vicinity of Crete was published by the USGS in 1974 (Reference 3). This publication included flood profiles and areas of inundation for the 1950 and 1967 floods. An approximate determination of the 100-year flood profile and boundary was also included in the report. Information contained in this report was used as reference material for the analyses made for this Flood Insurance Study.

A Flood Hazard Boundary Map for the City of Crete has been published by the Federal Insurance Administration (Reference 11). The differences between the Flood Hazard Boundary Map and this study are justified due to the more detailed nature of this Flood Insurance Study.

This report either supersedes or is compatible with all previous studies published on streams studied in this report and should be considered authoritative for purposes of the National Flood Insurance Program.

7.0 LOCATION OF DATA

Information concerning the pertinent data used in preparation of this study can be obtained by contacting the Natural and Technological Hazards Division, Federal Emergency Management Agency, 911 Walnut Street, Kansas City, Missouri 64106.

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8.0 REFERENCES AND BIBLIOGRAPHY

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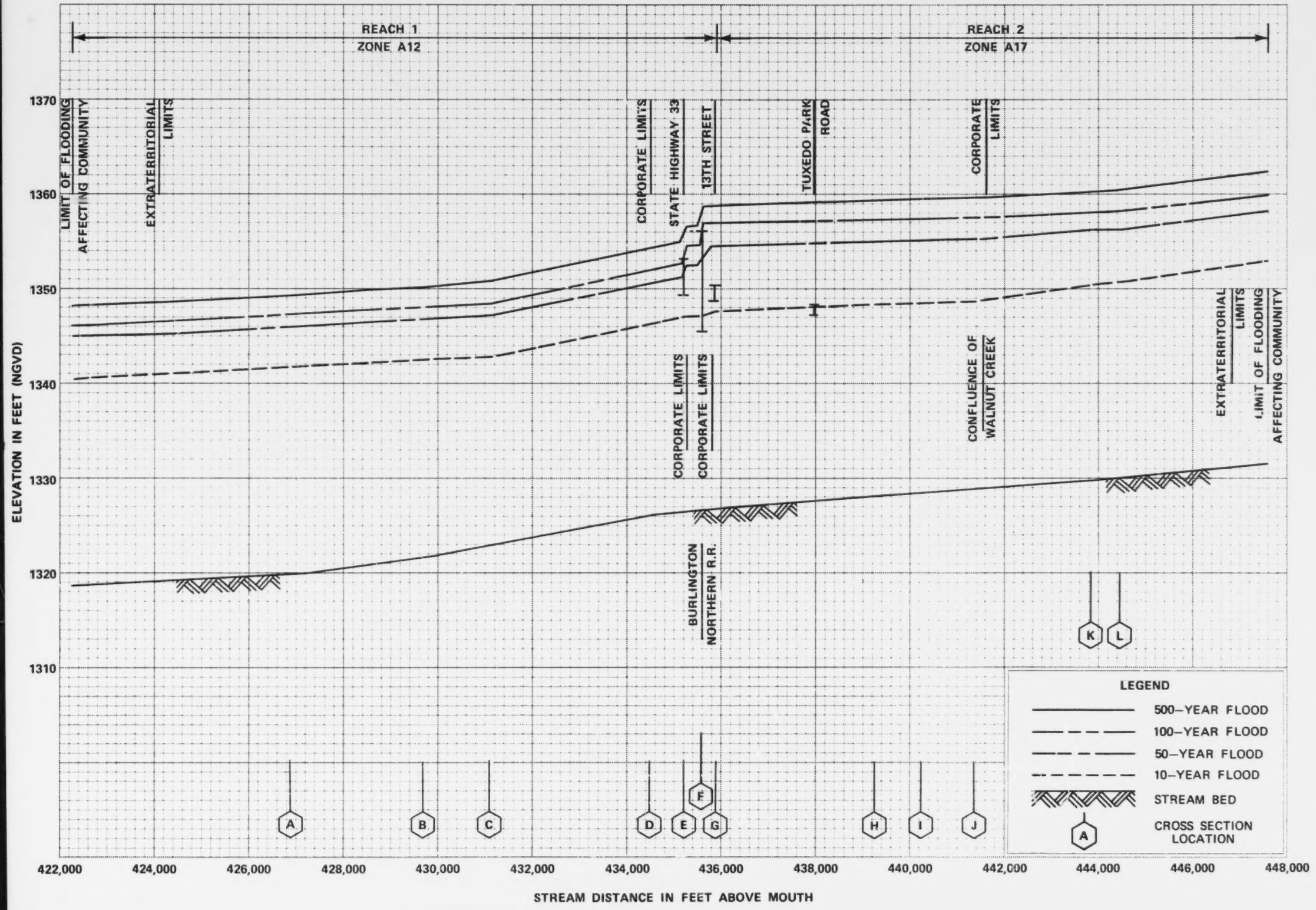

FLOOD PROFILES

BIG BLUE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF CRETE, NB
(SALINE CO.)

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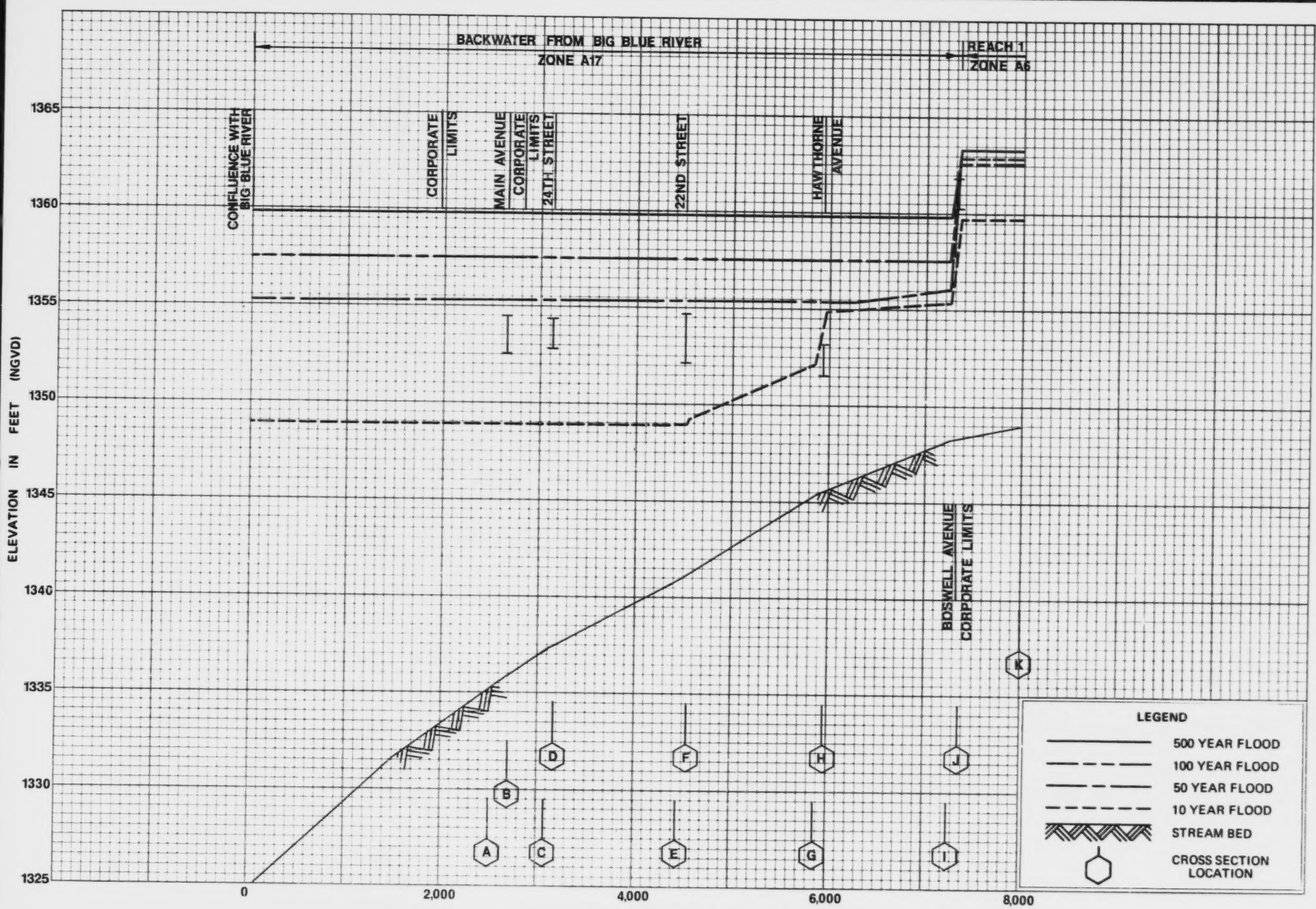

FLOOD PROFILES

WALNUT CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF CRETE, NB
(SALINE CO.)

02P

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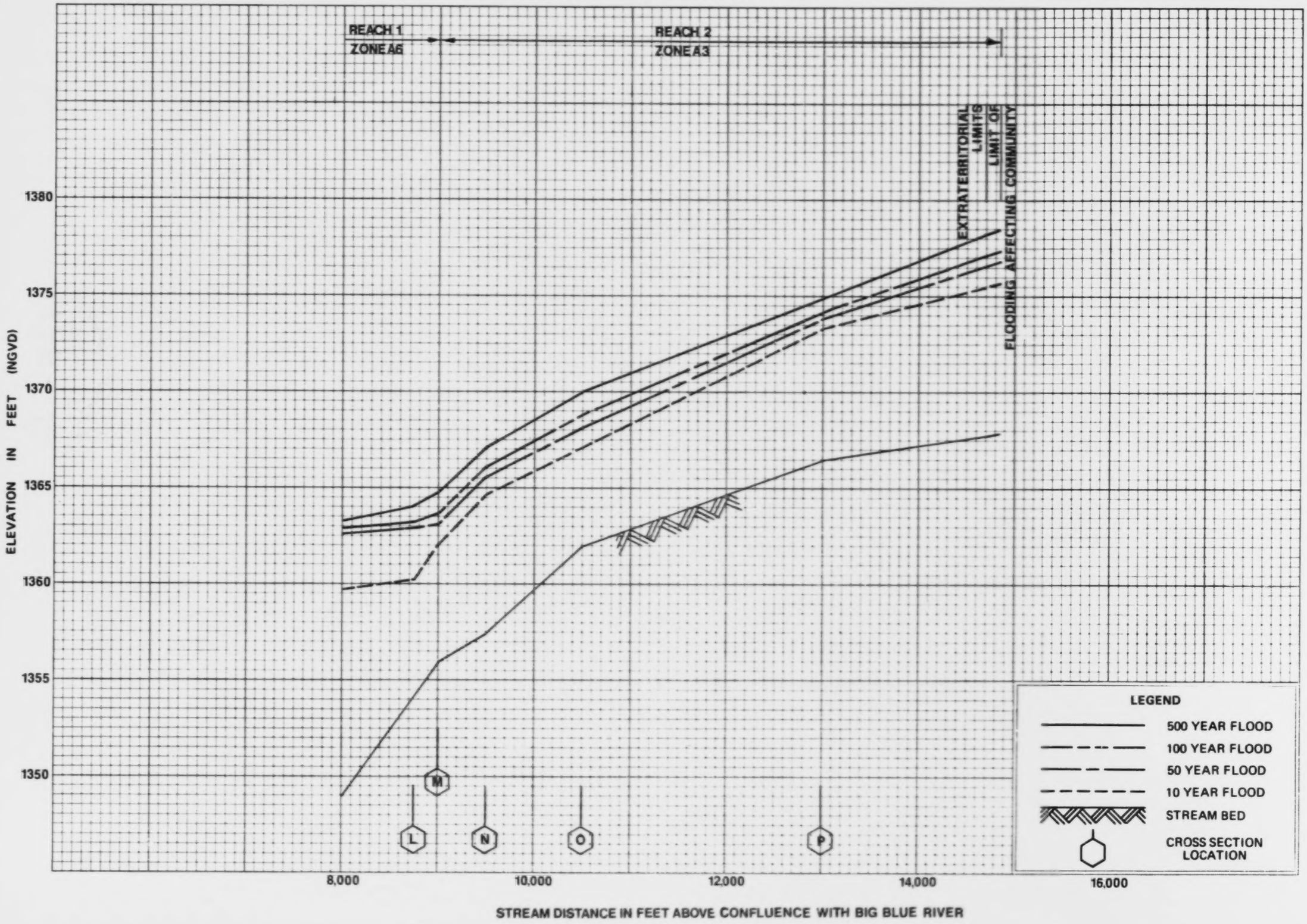

FLOOD PROFILES

WALNUT CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF CRETE, NB
(SALINE CO.)

03P